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ONTARIO WATER
RESOURCES COMMISSION

ANNUAL REPORT 1965

HUNTSVILLE

water pollution control plant

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1965
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DIVISION OF PLANT OPERATIONS
Ontario Water Resources Commission

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1965

Huntsville : water pollution control plant.
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ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE GENERAL MANAGER

Members of the Huntsville Local Advisory Committee,
Town of Huntsville.

Gentlemen:

I am pleased to provide you with the 1965 Annual Report for the Huntsville Water Pollution Control Plant, OWRC Project No. 58-S-15.

We appreciate the co-operation you have extended to our Operations staff throughout the year, and trust that continuation of this close association will ensure even greater progress in the sphere of water pollution control.

Yours very truly,

D. S. Caverly,
General Manager.

ONTARIO WATER RESOURCES COMMISSION
801 BAY STREET
TORONTO 5

J. A. VANCE, LL.D.
CHAIRMAN

J. H. H. ROOT, M.P.P.
VICE-CHAIRMAN

D. S. CAVERLY
GENERAL MANAGER

W. S. MacDONNELL
COMMISSION SECRETARY

General Manager,
Ontario Water Resources Commission.

Dear Sir:

I am pleased to provide you with the 1966 Annual Report on the operation of the Huntsville Water Pollution Control Plant, OWRC Project No. 58-S-15.

The report presents design data, outlines operating problems encountered during the year and summarizes in graphs, charts and tables all significant flow and cost data.

Yours very truly,

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

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FOREWORD

This report provides useful information on the operating efficiency of this project during 1965. It is intended to act as a guide in gauging plant performance. To implement that aim, it includes detailed statistical and cost data, a description of the project and a summary of its operation during the year.

Of particular interest will be the cost data, which show the total cost to the municipality and the areas of major expenditure.

The Regional Operations Engineer is primarily responsible for the preparation of the report, and has compiled and arranged the material. He will be pleased to answer any questions regarding it. Other groups, however, were involved in the production, and these include the statistics section, the Drafting Section of the Division of Sanitary Engineering and the Division of Finance.

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

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HUNTSVILLE
water pollution control plant

operated for

THE TOWN OF HUNTSVILLE

by the

ONTARIO WATER RESOURCES COMMISSION

CHAIRMAN: Dr. James A. Vance

VICE-CHAIRMAN: J. H. H. Root, M.P.P.

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GENERAL MANAGER: D. S. Caverly

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F. A. Voege
K. H. Sharpe
A. K. Watt

COMMISSION SECRETARY

W. S. MacDonnell

DIVISION OF PLANT OPERATIONS

DIRECTOR: B. C. Palmer

Assistant Director: C. W. Perry
Regional Supervisor: D. A. McTavish
Operations Engineer: J. N. Dick

801 Bay Street Toronto 5

'65 REVIEW

In 1965, Huntsville Water Pollution Control Plant treated a total of 66, 647, 000 gallons of waste, an average daily flow of 183,000 gallons. This is the largest volume of waste treated in the last five years. The flows were probably influenced by the unusually wet fall.

The operating costs of the treatment plant and associated pumping stations in 1965 were $9, 949. 50 or a cost of $149. 29 per million gallons of sewage treated. The operating costs decreased by $171. 57 in 1965 from that of 1964.

Salary costs increased in 1965 due to increased casual labour. More casual labour was used for weekend operation in 1965. Fuel costs have remained constant. Power costs were increased due to increased flows. Chemical costs have also remained constant. General Supplies, Equipment, and Repairs and Maintenance have varied little from 1964.

The tiles on the floor of the control building were replaced in 1965. The U. S. vari-drive unit that drives the return sludge pump was also rebuilt in 1965. The shoes on the collectors of the primary clarifier were replaced and a winch was added to the grit chamber bucket. One of the floats in the No. 1 pumping station was replaced with considerable difficulty, because the float guides had to be cut.

The plant produced an average effluent of 10 ppm BOD and 15 ppm SS. These results were obtained from eleven 8-hour composite samples. All samples were satisfactory except the sample collected in March. The results are within OWRC objectives. The plant removed an average of 93 percent of the BOD and suspended solids received, and this is considered a good plant removal efficiency for an activated sludge plant.

GLOSSARY

BOD	biochemical oxygen demand (a measure of organic content)
cfm	cubic feet per minute
comminution	shredding of solids into small fragments
DWF	dry weather flow
effluent	outflow
flocculation	bringing very small particles together to form a larger mass (the floc) before settling
fps	feet per second
gpcd	gallons per capita per day
gpm	gallons per minute
grit	sand, dust, stones, cinders and other heavy inorganic material
influent	inflow
lin. ft.	lineal feet
mgd	million gallons per day
mlss	mixed liquor suspended solids
ppm	parts per million
ss	suspended solids
TDH	total dynamic head (usually refers to pressure on a pump when it is in operation)

HISTORY
1957 - 1965

INCEPTION

On March 5, 1957 preliminary discussions were held with officials of the municipality of Huntsville to discuss proposals for a Water Pollution Control system for the town.

APPROVAL

A report prepared in 1954 by the consulting engineering firm of R. V. Anderson and Associates was updated, and on September 10, 1958, the OWRC issued its certificate of approval for the construction of sanitary sewers, three pumping stations and a sewage treatment plant.

CONSTRUCTION

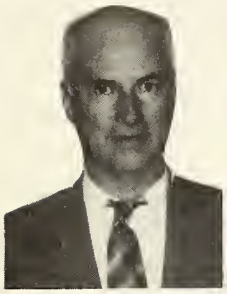
The construction of this project was divided into two parts, Contract A and B. Contract A consisted of sanitary sewers while Contract B consisted of the construction of the Water Pollution Control plant and pumping stations.

On November 18, 1959, the plant was officially put into operation.

This plant is designed to facilitate future construction of identical primary, aeration, final and digestion tanks thereby increasing the plant capacity to 500,000 Imperial gallons per day capable of serving a population of 6,000 persons.

TOTAL COST (Final)

$452,388.75



EDWIN C. DIPLOCK
CHIEF OPERATOR

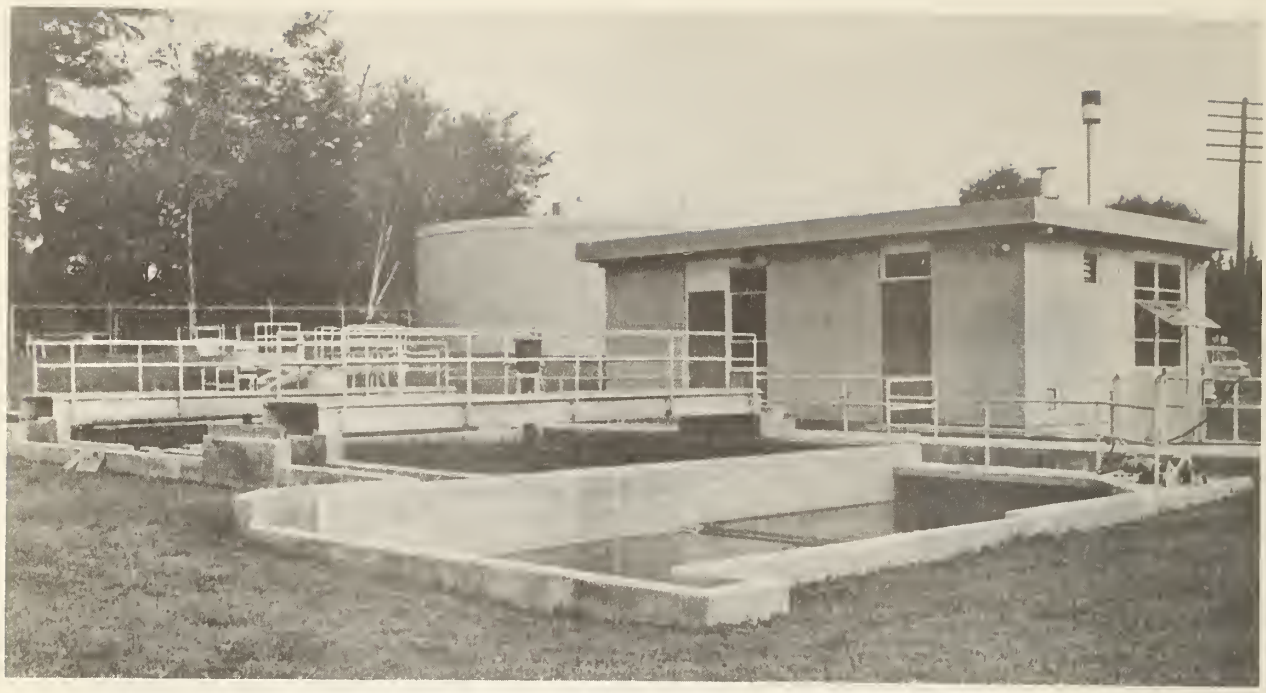
Project Staff

COMMENTS

The plant was staffed by one operator, Mr. E. Diplock, for five days of the week with weekend inspections provided by Mr. Diplock and casual labour.

Mr. Diplock attended the Chief Operators' conference in Toronto. He also attended the gas fitters' course in North Bay and was licensed as a certified gas fitter. The Department of Energy and Resources has made it mandatory that all personnel working on gas equipment be certified.

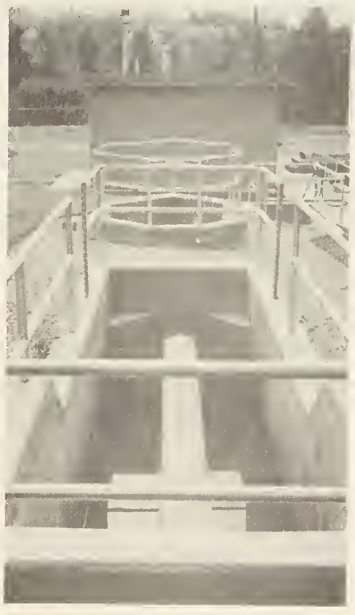
The operation of the project is under the supervision of the Division of Plant Operations. The operator should be commended for the interest he showed in his work and the manner in which it was executed.



Description of Project

INFLUENT WORKS

The sewage from the municipality is collected in a number of sanitary and combined sewers. Most of the sewage flows by gravity to one of three pumping stations from which it is then directed to the sewage treatment plant.



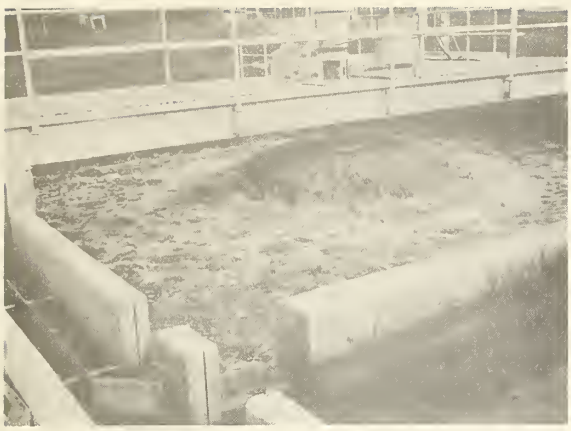
The sewage enters the plant through a grit removal chamber where the sand, grit and silty material are removed. Bar screens which are cleaned by hand are provided after the grit chamber for the removal of large foreign objects which could possibly damage the plant equipment. Provision has been made for the future installation of a comminutor to grind up material now screened out. From the screens the sewage flows to the primary sedimentation tank.

PRIMARY SEDIMENTATION TANK

The sewage is settled in the primary sedimentation tank for approximately two hours before passing on to the aeration tanks. During this retention period, organic solids settle out and are collected by a travelling sludge collector and then are pumped to the digester.

AERATION

In the aeration section, the effluent from the primary sedimentation tank is mixed with activated sludge from the secondary sedimentation tank to form "mixed liquor". Air is introduced to the mixed liquor by two Chicago pump mechanical aerators. With properly controlled aeration, a highly settleable sludge floc is formed.



AERATION TANK

FINAL SEDIMENTATION TANK

The floc is allowed to settle out in the final settling tank. The clear sparkling effluent produced in this manner flows over the peripheral weirs of the final settling tank and through a Parshall flume where the total flow is measured.



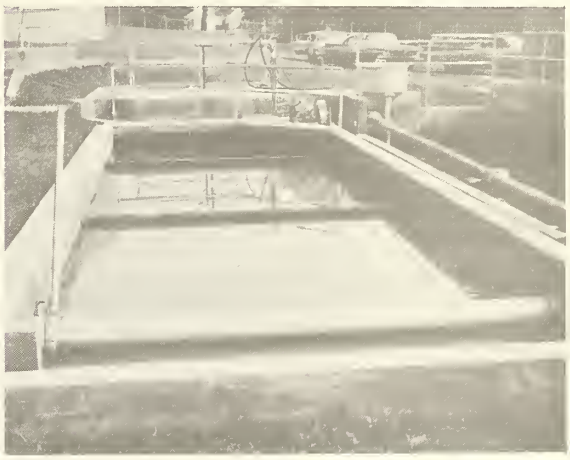
CHLORINE CONTACT CHAMBER

CHLORINE CONTACT CHAMBER

The effluent then flows to the chlorine contact chamber where it is chlorinated during the summer months as required by the Sanitary Engineering Division of the OWRC. It is then discharged to the Muskoka River.

SLUDGE DIGESTION TANKS

The sludge drawn from the primary tank and pumped to the digester is maintained at a temperature of 90° F. for a period of 28 days. The sludge is mixed and the digester temperature maintained by continually recirculating the liquid through a heat exchanger. Under this controlled environment, anaerobic bacterial action breaks down the raw sludge to a black, odourless liquid. During the process methane gas is produced which is then collected and used to heat the digester and control building.



PRIMARY SEDIMENTATION TANK

The digested sludge is hauled away by tank truck and disposed of on farmers' fields where it makes an excellent soil conditioner.



PROJECT COSTS

NET CAPITAL COST (Final) Long Term Debt to OWRC	$452,388.75
Net Operating	$ 9,949.50
Debt Retirement	-
Reserve	4,000.00
Interest Charged	25,348.58
TOTAL	$ 39,298.08

RESERVE ACCOUNT

Balance at January 1, 1965	$ 11,943.20
Deposited by Municipality	4,000.00
Interest Earned	757.23
Less Expenditures	-
Balance at December 31, 1965	$ 16,700.43

MONTHLY OPERATING COSTS

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	*SUNDRY	WATER
JAN	417.09	305.76					20.13		26.95	64.25	
FEB	512.08	305.76		28.30	120.30		13.38			37.72	6.62
MARCH	915.00	347.47		53.40	95.15		48.92			370.06	
APRIL	806.79	353.58	49.00	50.70	101.29		20.24			217.94	14.04
MAY	865.45	488.22	43.75	35.30	112.17		61.07		41.40	83.54	
JUNE	810.82	318.00	19.25	69.69	95.94	139.05	14.11	16.06	24.07	39.20	75.45
JULY	671.68	318.00	29.75	28.90	106.77		30.08			158.18	
AUG	819.96	318.00	45.50		100.81		30.30		51.07	153.87	120.41
SEPT	805.58	323.60	103.25	24.53	125.69	76.48	12.27			139.76	
OCT	1481.26	507.80	155.75	23.65	124.04		57.39		148.06	299.75	164.82
NOV	745.26	371.60	29.75	33.30	136.37		36.13			138.11	
DEC	1098.53	332.20	14.00	108.24	273.59		78.61	35.28	255.15	(53.94)	55.40
TOTAL	9949.50	4289.99	490.00	456.01	1392.12	215.53	422.63	51.34	546.70	1648.44	436.74

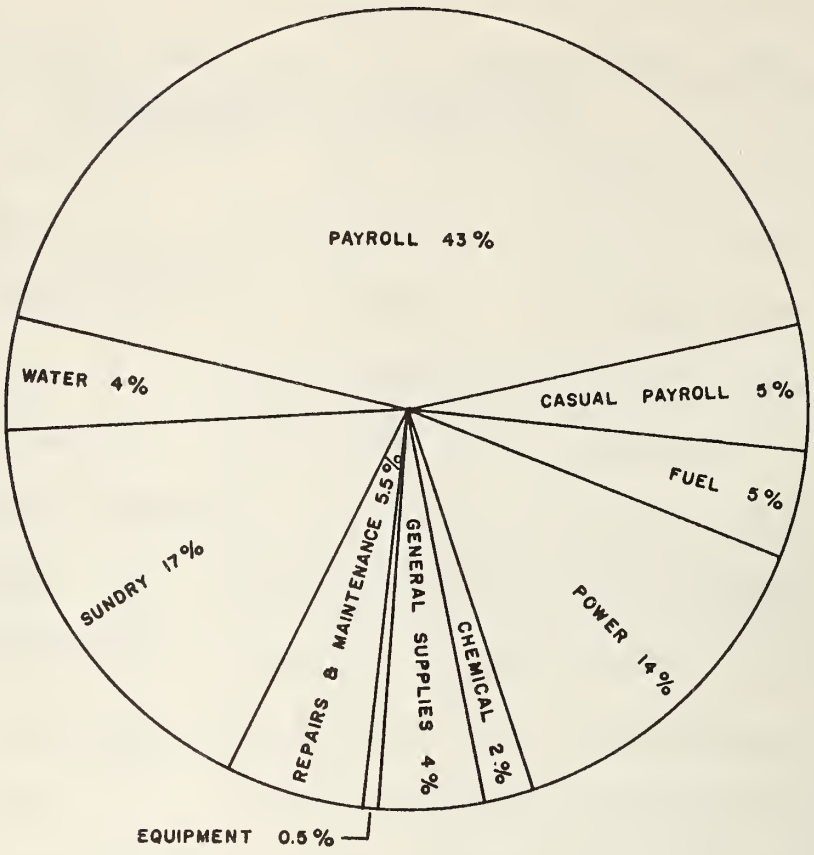
* SUNDRY INCLUDES SLUDGE HAULING COSTS WHICH WERE $1905.60
BRACKETS INDICATE CREDIT

YEARLY OPERATING COSTS

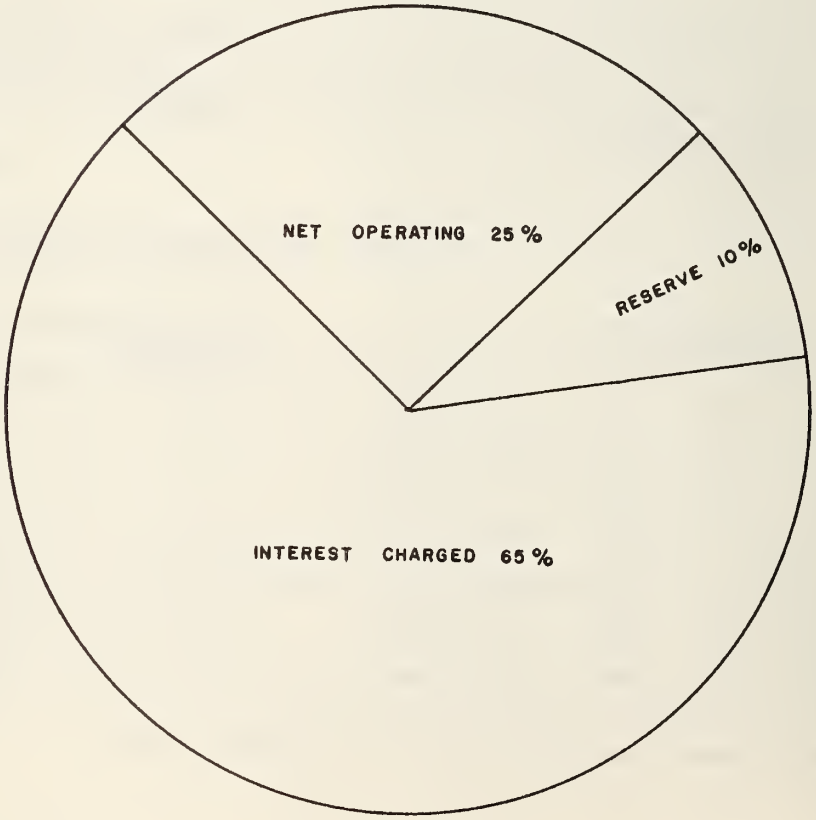
YEAR	M.G. TREATED	TOTAL COST	COST PER FAMILY PER YEAR	COST PER MILLION GALLONS	COST PER L.B. OF BOD REMOVED
1961	36.273	$ 8914.49	* $ 11.58	$ 246.00	19 CENTS
1962	59.580	$ 8458.91	$ 11.00	$ 142.00	8 CENTS
1963	65.140	$ 9645.51	$ 12.56	$ 148.00	15 CENTS
1964	63.247	$10121.07	$ 12.83	$ 159.75	12 CENTS
1965	66.647	$ 9949.50	$ 12.64	$ 149.29	11 CENTS

* BASED ON ANNUAL POPULATION ESTIMATE AND 3.9 PERSONS PER FAMILY

1965 OPERATING COSTS

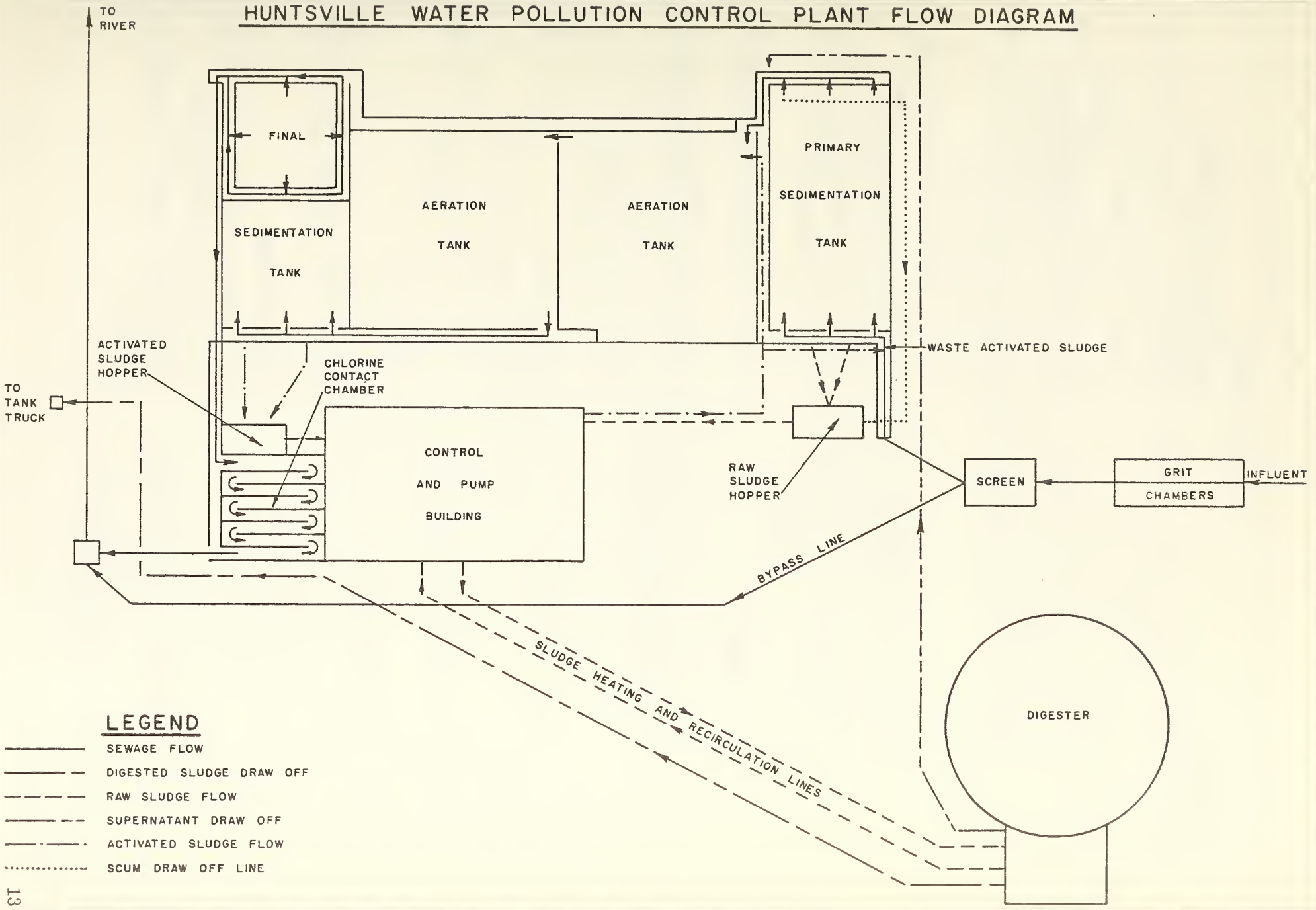


TOTAL ANNUAL COST



Technical Section

HUNTSVILLE WATER POLLUTION CONTROL PLANT FLOW DIAGRAM



Design-Data

GENERAL

Type of Plant - Activated sludge with mcchanical aeration.

Design Population - 3,000 persons.

Design Plant Flow - 250,000 gallons per day.

Per Capita Flow - 83 gallons per day.

Five Day BOD -

Raw Sewage	-	250 PPM
Removal	-	90-95%

Suspended Solids -

Raw Sewage	-	250 PPM
Removal	-	90-95%

PRIMARY TREATMENT

Grit Removal

Two parallel channels, 10 ft. long and 19 inches wide.

Volume - 52.5 cubic feet each.

Detention time - 1.9 minutes.

Screening

Provided by manually cleaned bar screen with provision for installing a comminutor.

Primary Sedimentation Tank

One tank 10 ft. x 30 ft. x 8 ft. deep.

Surface area - 300 square feet.

Volume - 2,400 cubic feet.

Detention time - 1.5 hours.

Surface Settling Rate - 833 gallons per sq. ft. of tank per day.

Overflow rate - 27,500 gallons per ft. of weir per day.

SECONDARY TREATMENT

Two tanks 24 ft. square by 12 ft. deep.

Volume - 14,000 cubic feet.

Detention time - 6.75 hours with 25% return sludge.

Air Supply - by mechanical aerators.

Final Sedimentation Tank

One tank 30 ft. x 13 ft. x 12 ft. deep.

Surface area - 390 square feet.

Volume - 4,700 cubic feet.

Detention time - 3 hours.

Surface Settling Rate - 640 gallons per ft. per day.

Overflow rate - 4400 gallons per lineal ft. of weir per day.

Chlorine Contact Chamber

One tank 12 ft. x 11.5 ft. x 10 ft. 3 in. side wall depth.

Detention time - 36 minutes.

Maximum dosage - 20 lbs. of chlorine per day.

Outfall Works

The effluent is discharged to the Muskoka River through 105 ft. of 15 inch corrugated metal pipe.

Digestion System

One single stage digester 30 ft. in diameter by 20 ft. side wall depth.

Heated digester capacity is 5 cubic feet per capita.

Process Data

FLOWS

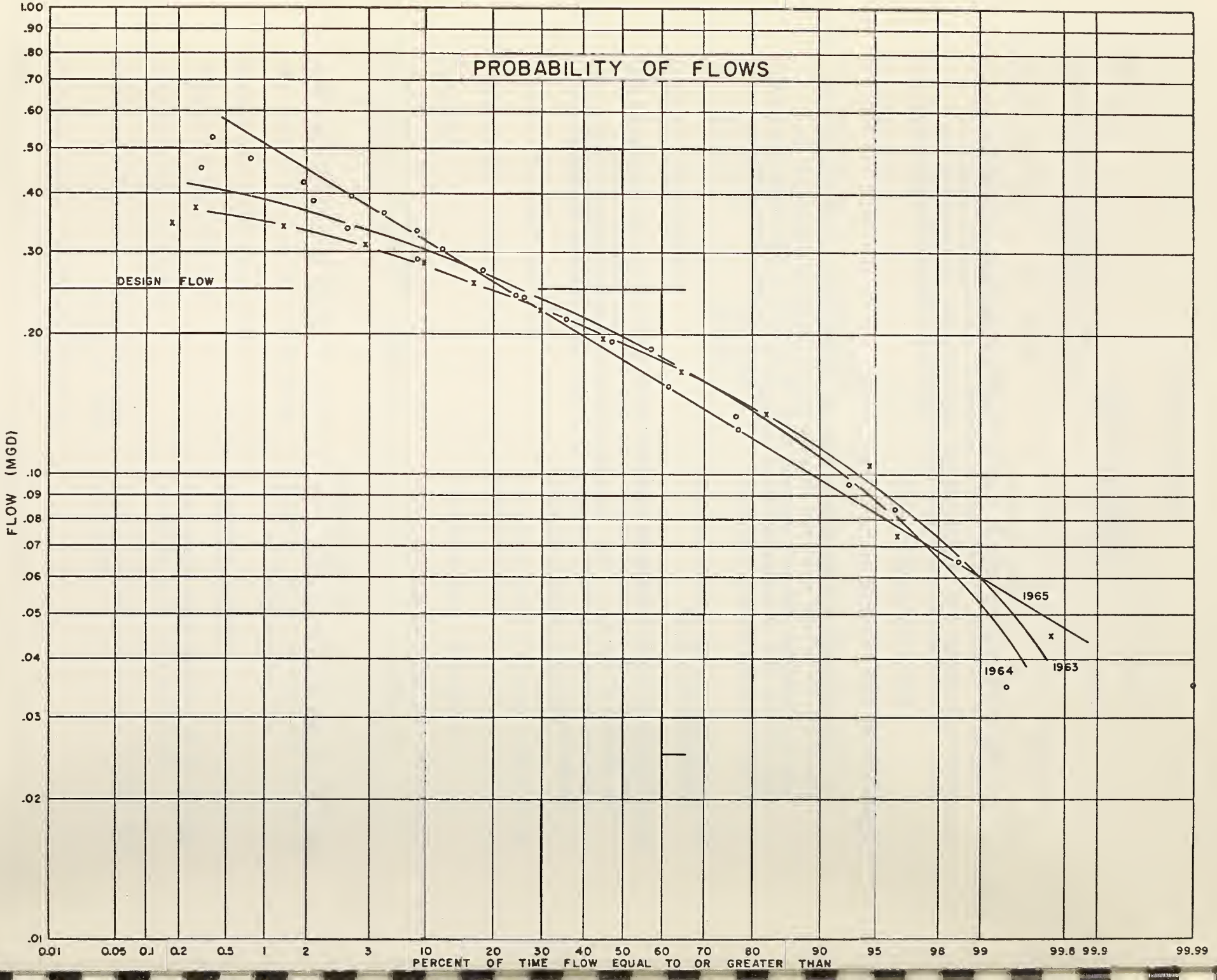
From the plot of probability of flows it should be noted that the flow was equal to or exceeded 175,000 gpd 50 percent of the time. The plant exceeded the design flow of 250,000 gpd approximately 20 percent of the time. The probability plot has not varied greatly for the past three years.

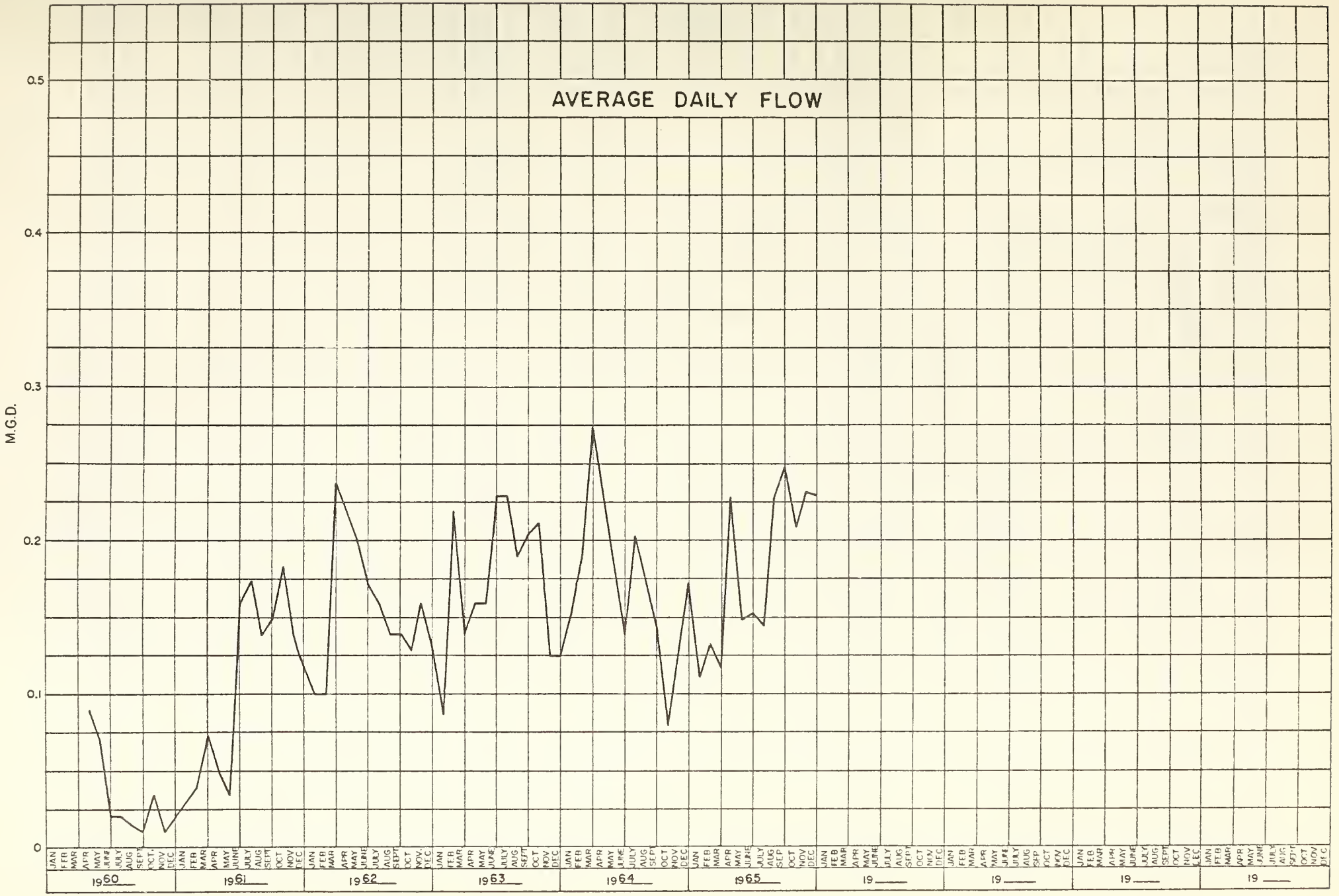
PROBABILITY OF BOD

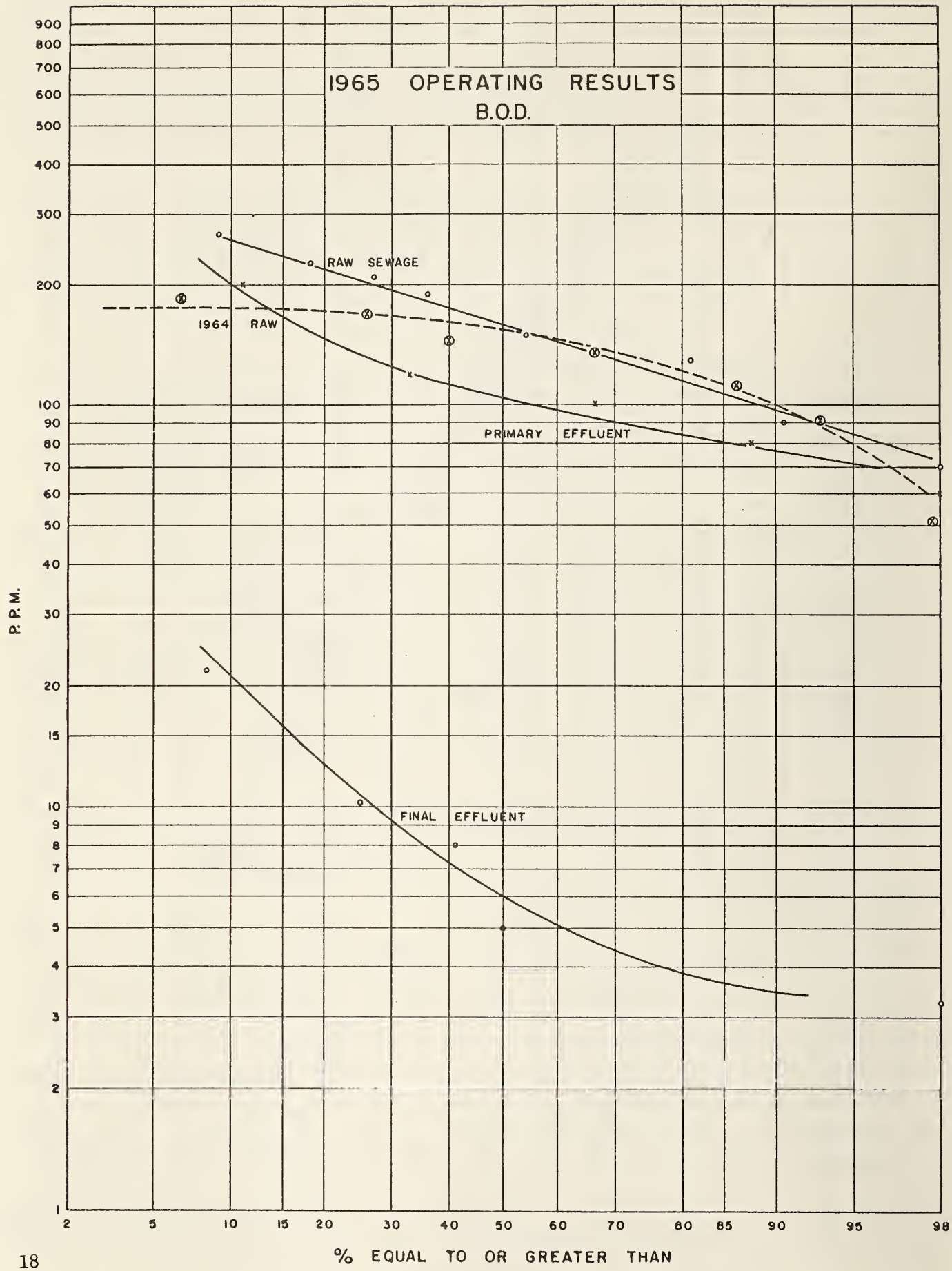
From the plot of probability of BOD it should be noted that the concentration of the raw sewage exceeded 250 ppm approximately 10 percent of the time and exceeded 160 ppm approximately 50 percent of the time. The final effluent BOD exceeded the OWRC objective of 15 ppm approximately 15 percent of the time.

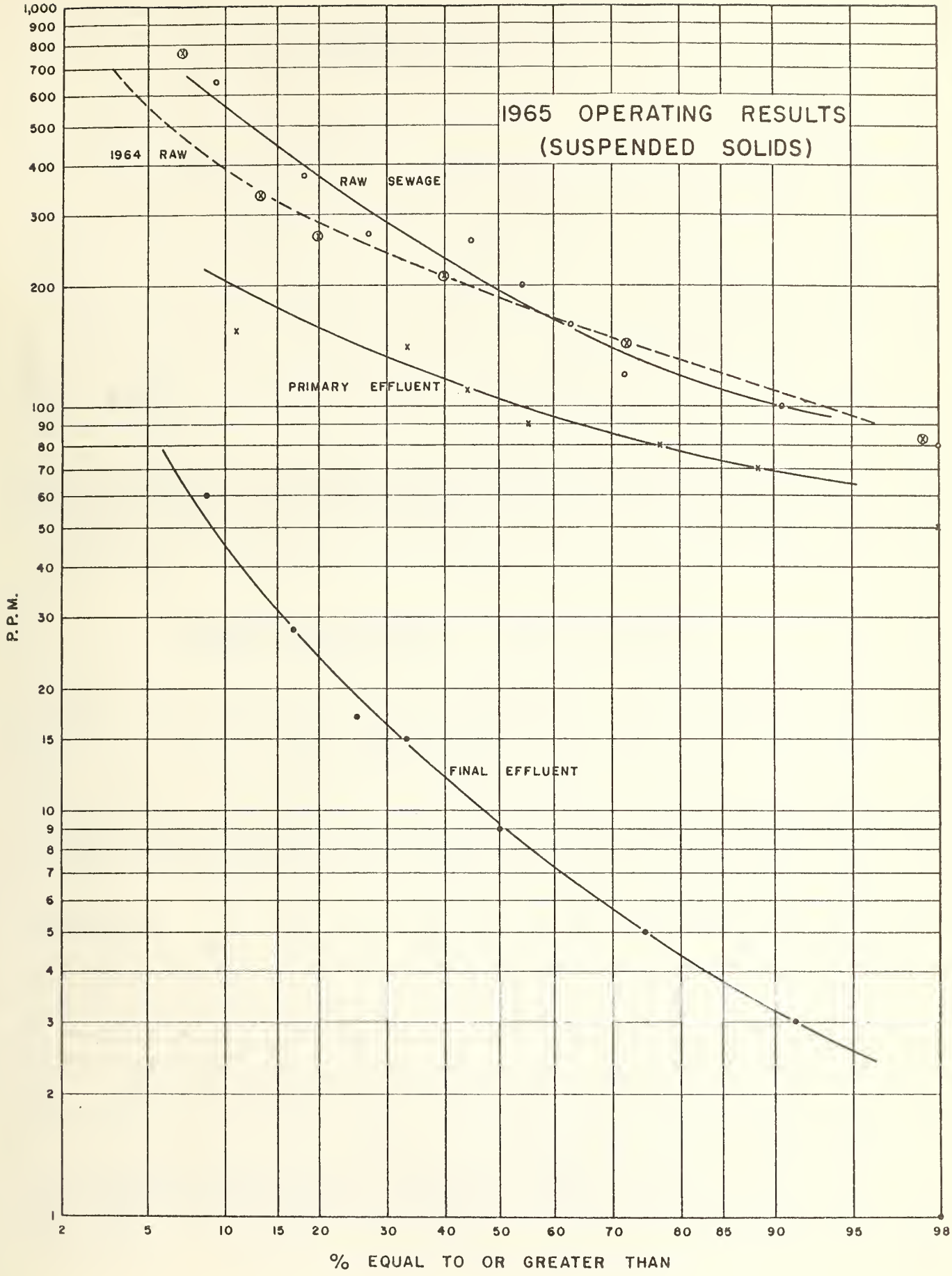
PROBABILITY OF SS

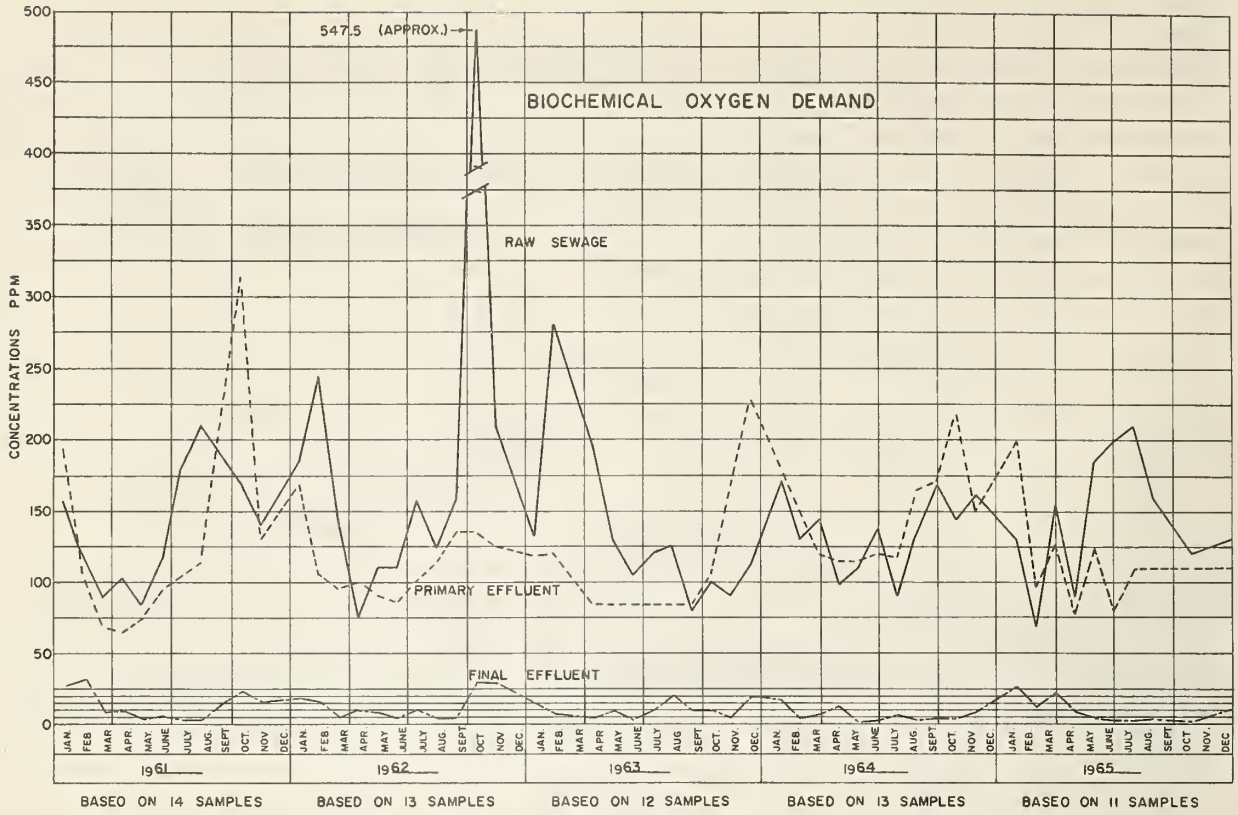
From the plot of probability of suspended solids it should be noted that the concentration of suspended solids in the raw sewage exceeded 200 ppm 50 percent of the time. The concentration of suspended solids in the effluent exceeded the OWRC objective of 15 ppm approximately 30 percent of the time.


PROBABILITY OF FLOWS
DESIGN FLOW
1965
1964
1963
FLOW (MGD)
1.00
.90
.80
.70
.60
.50
.40
.30
.20
.10
.09
.08
.07
.06
.05
.04
.03
.02
.01
0.01
0.05
0.1
0.2
0.5
1
2
3
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.99
PERCENT OF TIME FLOW EQUAL TO OR GREATER THAN

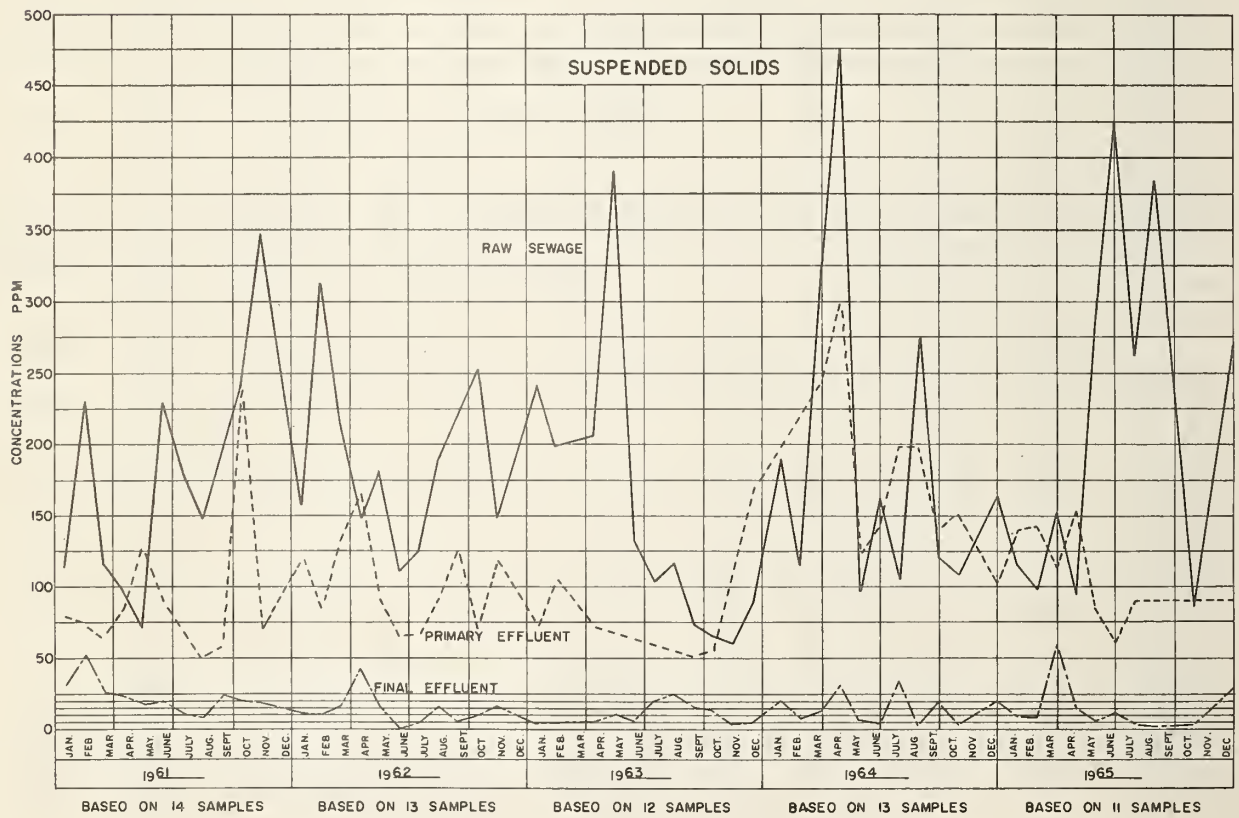

AVERAGE DAILY FLOW
M.G.D.
0.5
0.4
0.3
0.2
0.1
0
1960
1961
1962
1963
1964
1965
19
19
19
19
19


1965 OPERATING RESULTS
B.O.D.
RAW SEWAGE
1964 RAW
PRIMARY EFFLUENT
FINAL EFFLUENT
P.P.M.
% EQUAL TO OR GREATER THAN
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
1
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98


1965 OPERATING RESULTS
(SUSPENDED SOLIDS)
1964 RAW
RAW SEWAGE
PRIMARY EFFLUENT
FINAL EFFLUENT
P.P.M.
% EQUAL TO OR GREATER THAN
1,000
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
1
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98



MONTHLY VARIATIONS



GRIT, B.O.D AND S.S. REMOVAL

MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	
JAN.	130	26	80.0	1.8	115	9	92.0	1.8	12
FEB.	68	12	82.5	1.0	99	9	91.0	1.7	11
MAR.	155	22	86.0	2.4	152	60	60.5	1.7	4
APR.	90	8.8	90.0	2.8	95	15	84.0	2.8	28
MAY	185	4.8	97.5	4.1	280	6	98.0	6.3	20.5
JUNE	200	3.4	98.5	4.5	426	12	97.0	9.5	22
JULY	210	3.2	98.5	4.6	262	5	98.0	5.8	31
AUG.	160	4.4	97.0	5.5	384	2	99.5	13.5	65
SEPT.	*145	10	93.0	5.0	*217	15	93.0	7.5	62
OCT.	120	2.6	98.0	3.8	86	3	96.5	2.7	42
NOV.	*145	10	93.0	4.7	*217	15	93.0	7.0	13
DEC.	128	11	91.5	4.3	270	28	89.5	8.8	10.5
TOTAL	-	-	-	45.0	-	-	-	67.3	321
AVG.	145	10	93.0	3.8	217	15	93.0	5.6	27

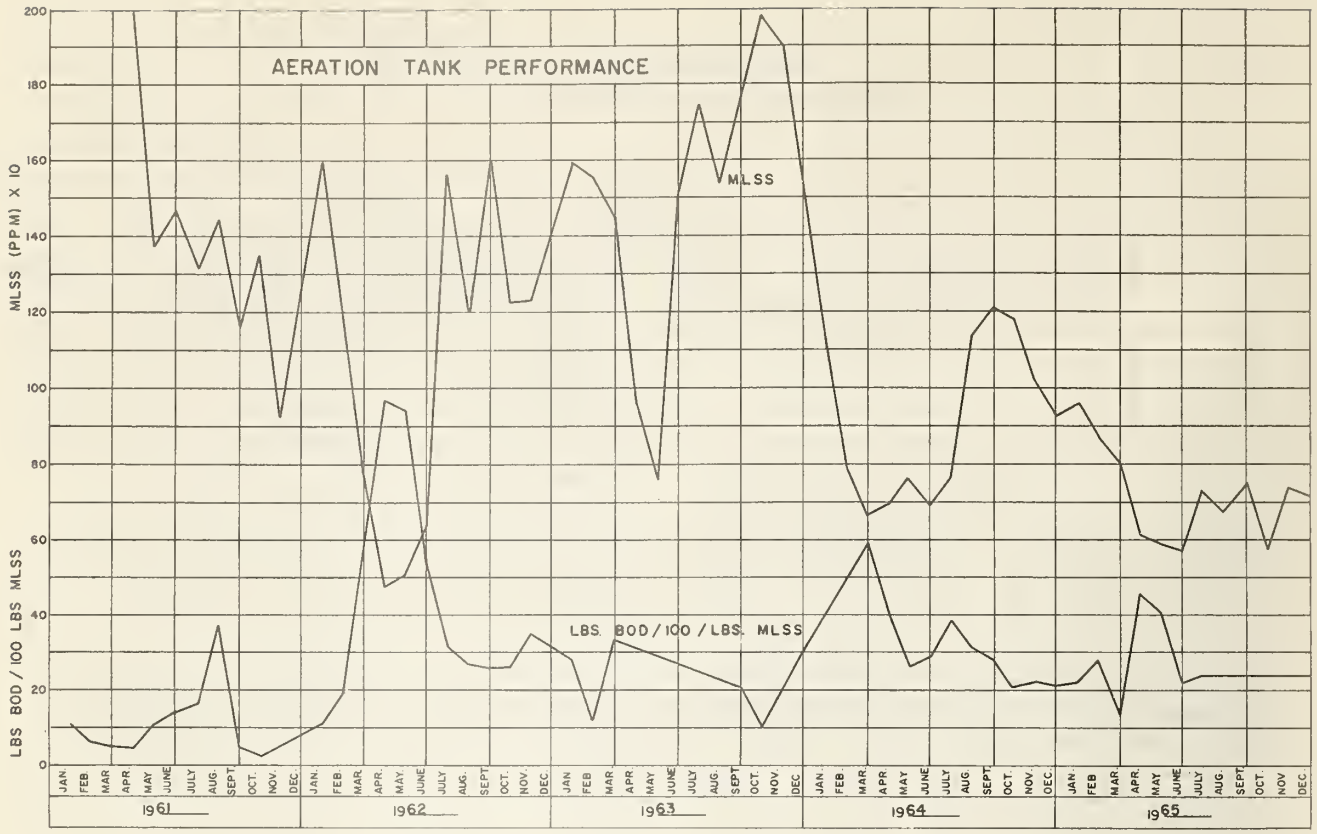
* Average value substituted. No sample

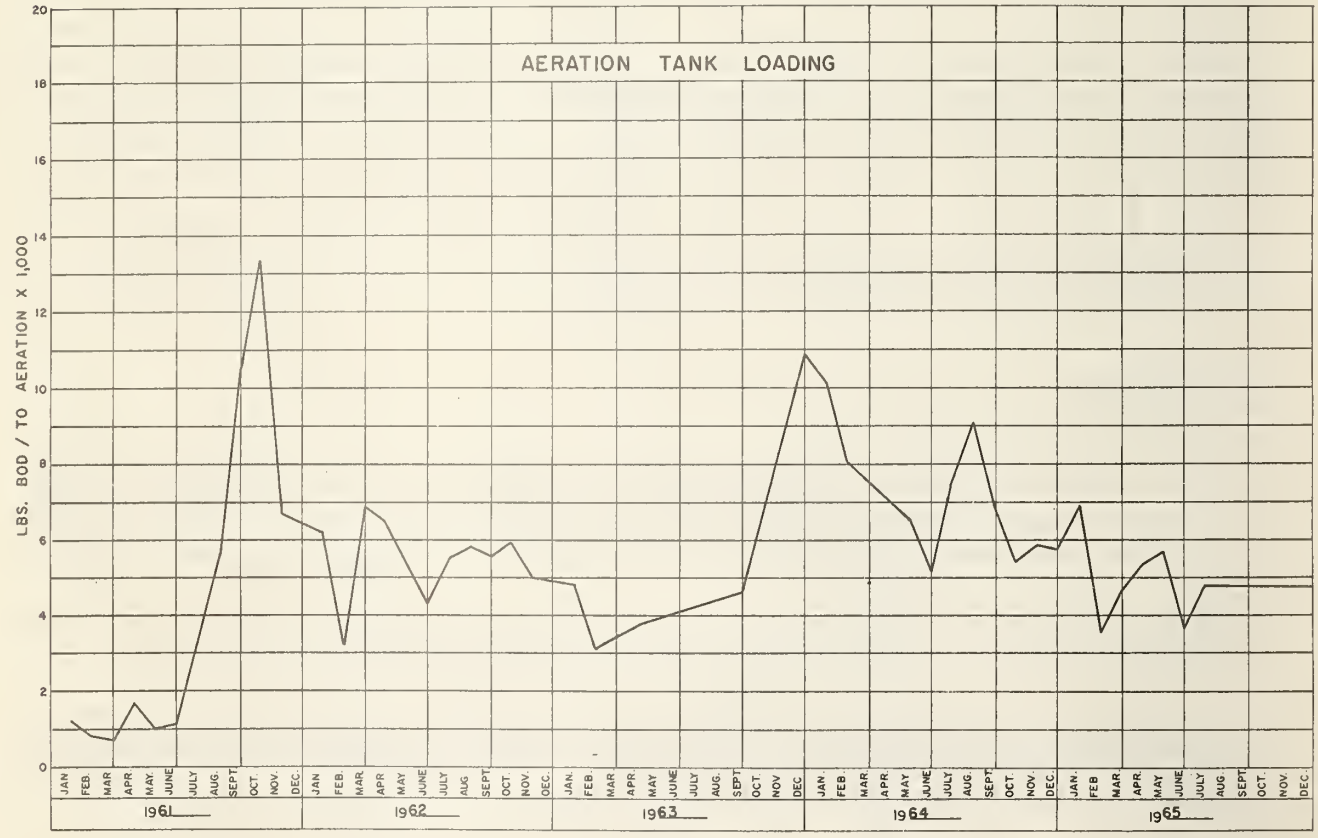
COMMENTS

The average strength of the raw sewage in 1965 was 145 ppm BOD and 217 ppm SS. These values were reasonable for domestic waste. The average concentration in the final effluent in 1965 was 10 ppm BOD and 15 ppm SS. This is within OWRC objectives. The values were obtained from 11-8 hour composite samples.

A total of 45 tons of BOD and 67.3 tons of SS were removed from the waste in 1965 which otherwise would have been discharged into the Muskoka River.

A total of 321 cubic feet of grit was removed from the waste which is rather high for the flows obtained and is indicative of combined sewers. This would indicate the accumulation of sound in the sewers also.

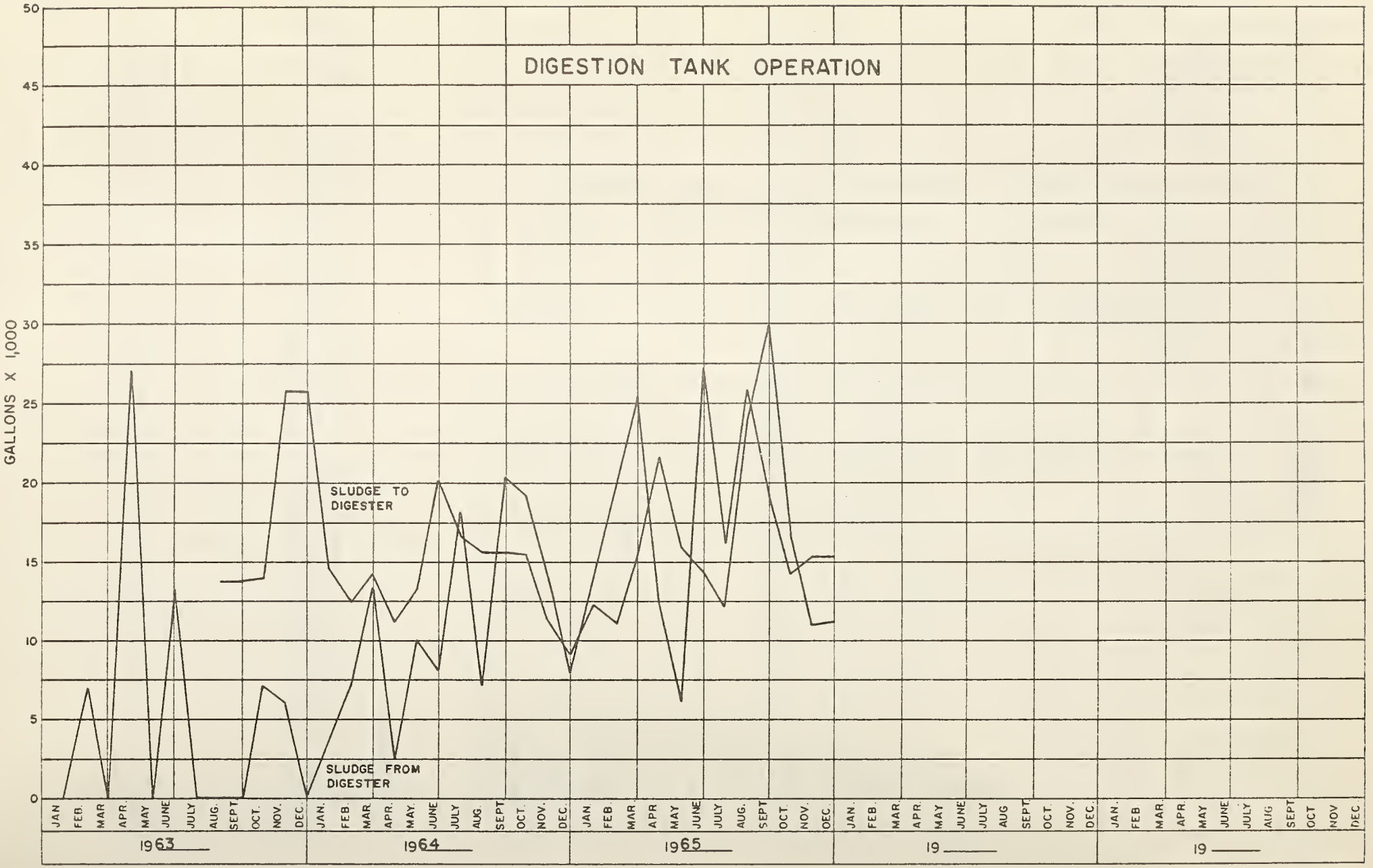

AERATION TANK PERFORMANCE
MLSS (PPM) X 10
LBS BOD / 100 LBS MLSS
MLSS
LBS. BOD / 100 / LBS. MLSS
200
180
160
140
120
100
80
60
40
20
0
JAN. FEB MAR APR MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.
1961
1962
1963
1964
1965


AERATION TANK LOADING
LBS. BOD / TO AERATION X 1,000
20
18
16
14
12
10
8
6
4
2
0
JAN FEB MAR APR MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.
1961
1962
1963
1964
1965

MONTH	PRIM. EFFL B.O.D. P.P.M.	M.L.S.S. P.P.M.	LBS. BOD. PER 100 LBS. M. L. S. S.	CUBIC FEET AIR PER LB. B.O.D. REMOVED
JANUARY	200	960	22	-
FEBRUARY	96	877	28	-
MARCH	126	803	14	-
APRIL	78	616	46	-
MAY	124	591	41	-
JUNE	80	576	22	-
JULY	108	728	22	-
AUGUST	-	666	-	-
SEPTEMBER	-	751	-	-
OCTOBER	-	575	-	-
NOVEMBER	-	670	-	-
DECEMBER	-	660	-	-
TOTAL	-	706	28	-
AVERAGE	116	706	28	-

COMMENTS

The average mixed liquor concentration in the aeration tanks was 706 ppm. The average lbs. of BOD per 100 lbs. of mixed liquor suspended solids was 28. This is a reasonable plant loading for efficient plant operation.


DIGESTION TANK OPERATION
GALLONS X 1,000
50
45
40
35
30
25
20
15
10
5
0
SLUDGE TO DIGESTER
SLUDGE FROM DIGESTER
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC
1963
1964
1965
19
19

DIGESTER OPERATION

MONTH	SLUDGE TO DIGESTERS			SLUDGE FROM DIGESTERS			GAS PRODUCED 1000'S Cu. Ft.
	1000'S CU. FT.	% SOLIDS	% VOL. MAT.	1000'S CU. FT.	% SOLIDS	% VOL. MAT	
JAN.	1.96	4.10	-	-	2.20	-	-
FEB.	1.81	4.50	-	-	2.18	-	-
MAR.	2.45	1.60	-	4.05	3.44	-	-
APR.	3.46	9.84	-	1.94	3.02	-	-
MAY	2.54	5.87	-	0.97	2.90	-	-
JUNE	2.30	4.35	-	4.37	4.50	-	-
JULY	1.95	3.98	-	2.43	-	-	-
AUG.	3.81	6.06	-	3.72	4.40	-	-
SEPT.	4.73	-	-	3.08	-	-	-
OCT.	2.68	1.77	-	2.27	2.78	-	-
NOV.	1.73	-	-	2.43	-	-	-
DEC.	1.77	7.34	-	-	9.11	-	-
TOTAL	31.19	-	-	25.26	-	-	-
AVG.	2.60	4.94	-	2.81	3.84	-	-

COMMENTS

A total volume of 31,190 cubic feet of raw sludge was pumped to the digester in 1965 as compared to 27,250 cubic feet in 1964. The quantity of sludge removed in 1965 was 25,260 cubic feet or a reduction of 19% as compared to a reduction of 23% in 1964.

This was acceptable for a single stage digester.

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (PPM)
JANUARY	3.450	-	-
FEBRUARY	3.734	-	-
MARCH	3.671	-	-
APRIL	6.884	-	-
MAY	4.580	*200	4.83
JUNE	4.572	191	4.18
JULY	4.480	270	6.03
AUGUST	7.089	328	4.63
SEPTEMBER	7.435	272	3.66
OCTOBER	6.482	**160	3.64
NOVEMBER	6.956	-	-
DECEMBER	7.314	-	-
TOTAL	66.647	1421	-
AVERAGE	5.554	237	4.42

* 28 days of chlorination
** 21 days of chlorination

COMMENTS

Chlorination, for the purpose of effluent disinfection, was carried out from May 4, 1965 to October 21, 1965.

It required an average dosage of 4.42 ppm of chlorine to obtain the OWRC objective of 0.5 ppm chlorine residual after a contact of 15 minutes.

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ONTARIO WATER
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Huntsville : water pollution control plant.
82198

RECOMMENDATIONS

1. The Town of Huntsville should continue its program of storm water separation so that storm water by-passing will be reduced to a minimum.

2. The grounds and the driveway on the plant site require attention in 1966. It is proposed that this be done from the Reserve for Contingencies Fund.

DATE DUE

TD227/H86/W38/1965/MOE
Ontario Water Resources Co
Huntsville water
pollution control plant
annual report c.1 a aa atfj
1965

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